

Continuous-Scan Phased Array Measurement Methods for Turbofan Engine Acoustic Testing, Phase I

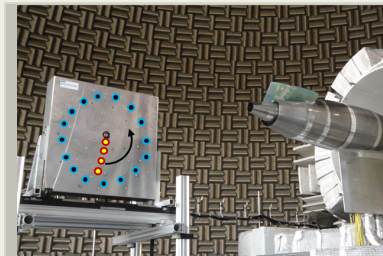
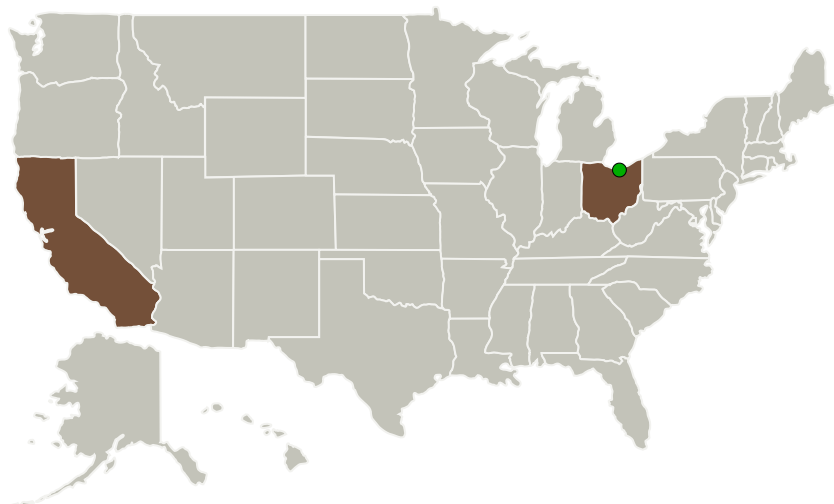
Completed Technology Project (2016 - 2016)



Project Introduction

ATA Engineering, Inc., (ATA) proposes an SBIR project to advance the technology readiness level (TRL) of a method for measuring phased array acoustic data for complex distributed noise sources using continuously moving (referred to here as continuous-scan, or CS) microphones in conjunction with state-of-the-art phase-referencing techniques. The proposed project aims to develop two novel modules to the existing suite of tools for CS acoustic measurements: (1) A continuous-scan beamforming (CSBF) tool for arrays located in the mid to far field to perform source diagnostics in low-SNR wind tunnel environments., and (2) An azimuthal modal decomposition tool for near-field arrays having partial azimuthal coverage, enabling acoustical holography without full source enclosure. The first module will enable small-aperture beamforming (BF) arrays to adopt the CS method, resulting in reduced maximum sidelobe levels and higher-quality BF images that approach the theoretical limits associated with the theory. The second module will enable CS near-field arrays that avoid the requirement for full coverage, greatly simplifying the array coverage requirements and making acoustical holography systems more practical in testing facilities. In Phase I, ATA will demonstrate feasibility of the methods through application to existing acoustic measurement data sets. In Phase II, the methods will be optimized and rigorously validated through experiments using small-scale turbofan engine models. Ultimately, we will transition these methods to NASA and industry stakeholders for adoption in relevant facilities.

Primary U.S. Work Locations and Key Partners



CS beamforming array concept – Stationary reference sensors (periphery), rotating (scanning) inner radial array

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Organizations Performing Work	Role	Type	Location
ATA Engineering, Inc.	Lead Organization	Industry	San Diego, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

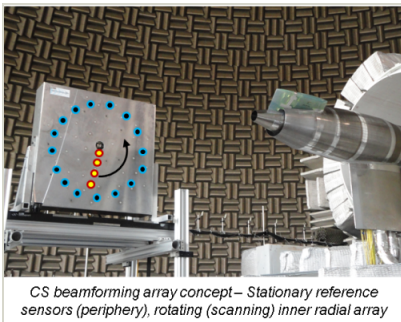
▶ **June 2016:** Project Start

✓ **December 2016:** Closed out

Closeout Documentation:

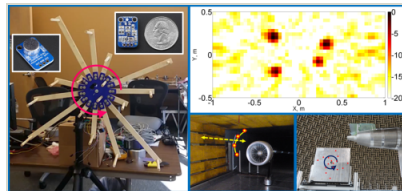
- Final Summary Chart(<https://techport.nasa.gov/file/139836>)

Images



Briefing Chart Image

Continuous-Scan Phased Array Measurement Methods for Turbofan Engine Acoustic Testing, Phase I
(<https://techport.nasa.gov/image/127377>)



Final Summary Chart Image

Continuous-Scan Phased Array Measurement Methods for Turbofan Engine Acoustic Testing, Phase I Project Image
(<https://techport.nasa.gov/image/129246>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ATA Engineering, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

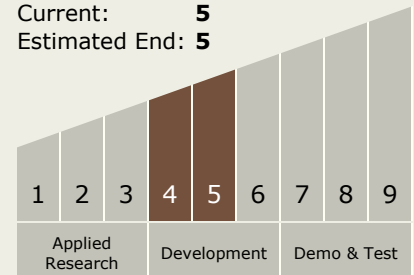
Carlos Torrez

Principal Investigator:

Parthiv N Shah

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.4 Aeroacoustics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System